Specifying objectives and performance metrics for the MSE:
a discussion document in preparation for Hake MSE Working Group Call #1

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Goal for the call: Translate aspirational management objectives to operational objectives and performance metrics

The following aspirational management objectives were previously translated from the Treaty by the JTC (JTC 2014):

1. The offshore Pacific Hake resource is above a certain ***threshold*** to allow for a ***sustainable population*** and ***sufficient numbers*** in a ***diversity of age classes***. A threshold may be defined as *a* ***level that does not impair recruitment***.
2. Both parties can achieve their ***intended benefits***.

However, the bolded words above require more specificity to translate them to operational objectives, and ultimately performance metrics for the MSE. A fully specified operational objective has 3 components:

- A **target** or **threshold** value that can be represented in an operating model
- A **time horizon** over which to measure the value
- An acceptable **probability** of achieving the target or avoiding the threshold

Hypothetical examples of fully specified operational objectives aligned with the first aspirational objective and the current harvest control rule would be:

- *The offshore Pacific Hake resource is above 10 percent of unfished biomass in 95 percent of the years over a 30 year period (at least 28 out of 30 years).*
- *The offshore Pacific Hake resource is above 40 percent of unfished biomass in XX percent of years over a XX year period*

These objectives translate to performance metrics we would track in the simulations:

- *The percent of years (out of 30) that coastwide spawning biomass is above 10 percent of unfished biomass.*
- *The percent of years (out of 30) that coastwide spawning biomass is above 40 percent of unfished biomass.*

For the second objective, we would like more interpretation from the MSEWG on what “intended benefits” means. Two potential interpretations might be:

- ability of each country to attain their allocation of the TAC as specified in the treaty (or some minimum proportion of attainment)
- economic viability of the industry in each country (this could include minimum acceptable revenues or net present value based on the age distribution, or minimum acceptable catch rates [tons/haul] required to operate the fishery, or a minimum TAC--180k used previously as a floor)

Previous performance metrics

Previous iterations of the MSE (Hicks et al. 2014, 2016) did not include explicit operational objectives. Instead, they used performance metrics that were all calculated over two time horizons (first 10 years and last 10 years of a 30 year simulation), capturing aspects of stock status, age structure, and yield. In this iteration, with the spatial operating models, we can better address the objective "both parties can achieve their intended benefits" by representing metrics spatially. Below is a table listing all previously used performance metrics, with open columns for you to consider whether these metrics are most useful under short or long time horizons, and coastwide or in US and Canadian waters. Showing results for all metrics in all dimensions will likely be too much information, so prioritizing among these metrics will be useful.

	Time horizon		**Spatial scale**	
	Short-term	Long-term	Coast-wide	Country-specific
Stock status metrics				
Average percent unfished biomass (SSB/SSB0)				
Probability that percent unfished biomass drops below 10%				
Probability that percent unfished biomass is between 10% and 40%				
Probability that percent unfished biomass is above 40%				
Average age of the population				
Average age 4+ biomass				
Percent of fish biomass that is age 4+				
Yield metrics				
Average TAC				
Average annual variability in catch				
Probability that fishery is closed (TAC=0)				
Probability TAC is below 180k tons				
Probability TAC is between 180k and 370k tons				
Probability TAC is above 370k tons				

Discussion questions to guide the meeting:
What numerical values would you assign to XX in the operational objectives stated above? How would you reword them to make them more reflective of management goals? What other operational objectives do you think are important to specify?

What is your interpretation of “both parties achieve their intended benefits”?

Do you think the previous thresholds used for biomass performance metrics (10 and 40 percent unfished) and catch performance metrics (180k and 370k tons) are sufficient, or should we consider others?

How would you prioritize among the potential performance metrics? What are your most preferred 3-5 performance metrics?

Which metrics do you care about more in the short-term? Which metrics are more useful in longer time horizons? Which metrics would you like to see represented spatially?

Are there other metrics that aren’t in the table that you would like to see? E.g., would revenue metrics be useful?